**Hands-on experiential**

Hands-on learning has become a common phrase in science education. Like many other highly used terms and phrases, there are various interpretations of what is meant by "hands-on learning."

Hands-on learning is learning by doing - it is any educational experience that *actively* involves people in manipulating objects to gain knowledge or understanding. Vocational education has always understood that if you want someone to learn to repair an automobile, you need an automobile to repair. If you want to teach someone to cook you put them in a kitchen. Whoever heard of teaching someone to swim in a traditional classroom? In order to truly teach science, we must "do" science.

I hear, and I forget.  
I see, and I remember.  
I do, and I understand.  
  
-- Chinese Proverb

It has been proven through educational research that students will have a vivid and lasting understanding of what they *do* much more than what they only hear or see.

Hands-on learning involves the child in a total learning experience which enhances the child's ability to think critically. The child must plan a process to test a hypothesis, put the process into motion using various hands-on materials, see the process to completion, and then be able to explain the attained results. Hands-on learning enables students to become critical thinkers, able to apply not only *what* they have learned, but more importantly, the *process of learning*, to various life situations. Hands-on learning is the only way students can directly observe and understand science.

These days there is more emphasis on hands-on materials than in the recent past. Almost all the major science curriculum developments of the 1960s and early 1970s promoted hands-on practical work as an enjoyable and effective form of learning. Since the curricula innovations of the 1960s, the emphasis in laboratory activities has been providing students with hands-on experiences. Good science programs cannot exist without hands-on. We must continue to emphasize the necessity of hands-on in science curriculum, and keep the hands-on component at a high level.

A hands-on approach requires students to become active participants instead of passive learners who listen to lectures or watch films. Laboratory and field activities are traditional methods of giving students hands-on experiences. With the advent of classroom technology, students can now participate in a non-traditional form of hands-on education through the use of computers. This technology extends hands-on learning to include minds-on skills.

Hands-on quite literally means having students 'manipulate' the things they are studying - plants, rocks, insects, water, magnetic fields - and 'handle' scientific instruments - rulers, balances, test tubes, thermometers, microscopes, telescopes, cameras, meters, calculators. In a more general sense, it seems to mean learning by experience.

Students work directly with materials and manipulate physical objects to physically engage in experiencing science phenomena. It involves the thinking, reading, writing, or research that gives meaning to hands-on. Students probe, collect, and analyze data; draw conclusions; and ask new questions.

Hands-on learning can be thought of as comprising three different dimensions: the inquiry dimension, the structure dimension, and the experimental dimension. In inquiry learning, the student uses activities to make discoveries. The structure dimension refers to the amount of guidance given to the student. If each step is detailed, this is known as a cookbook style lab. These types of activities do not increase a student's problem-solving abilities. The third dimension is the experimental dimension which involves the aspect of proving a discovery, usually through the use of a controlled experiment.

Imitating the work of the scientists in investigating the natural world, usually in the laboratory, is found in all the new curricula. Whether it is called inquiry, scientific process, or problem-solving, each curricula group espoused the virtues of "hands-on" experiences to gain greater insights into the basic concepts of science.

The term hands-on first surfaced in the late 1960s meaning to learn how to use a computer by actually using one - hands-on the keyboard, as it were. Although the computer people coined the term, the idea of learning by doing is an ancient one in the arts and crafts, and it has become a mark of good teaching in science and math.

**COOL RESOURCE:** <http://www.exploratorium.edu/>

Exploratorium is a website which is making science visible, touchable, and accessible to a wide variety of people—at the museum, online, and in the classroom—their explore-for-yourself way of learning and teaching impacts science education worldwide. The professional development programs provide teachers with the skills, tools, and support they need to apply inquiry-based learning and teaching in their classes. Structured learning programs bring learning by doing directly to a diverse group of people. The programs make connections between the traditionally separate worlds of formal (school) and informal (museum) education and understanding.

The hands-on experiential tools are under the link <http://www.exploratorium.edu/explore/>, where all the materials are divided into 10 categories:

* Astronomy & space
* Culture
* Earth
* Everyday science
* Human body
* Listening
* Living things
* Material world
* Mind
* Seeing

On each topic the site provides explanatory websites and a variety of things to see, make and do on the same website.

For some simulations you need Java, which can be downloaded for free from <http://www.java.com/en/>